**Cardiovascular Physiology**

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| **O2 Consumption**  \*Metabolically active tissues reduce hemoglobin’s affinity for O2  **O2 Extraction**   * Regular resting tissues extract ratio is only 25%; Heart extracts like 80% so its very prone to ischemia   In increased O2 demand/ Tissue metabolic consumption can ↑ Flow or ↑Extraction | * Thus velocity decreases with an increase in cross-sectional area (dilation of BV)—reciprocal change in velocity and SA * ^^how much volume an artery will accept if you ↑ P | **Work**  Work= Force x Distance  Force = Pressure x Area  Work= Pressure x Volume  Work= Afterload x Stroke Volume  **Work≈ Systolic BP x Stroke Volume**  \*O2 demand is higher for pressure work than volume work. Unclear why. |
| **Law of Laplace**  Tension = Pressure x radius  This is the reason why capillaries (w/ no elastic tissue) can withstand higher P  Can compensate for ↑ P by smaller radius |

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| **Fick Equation**  **-F**= flow  **Rate of addition**=rate of X crossing the probe  \*Rate at which lungs are adding oxygen can be caulcated by oxygen concentration in pulmonary artery minus oxygen concentration in the pulmonary vein.  \*Make sure everything is in the same units!!  To measure CO   * Cold saline solution is a common tracer used to measure CO by measuring the temperature of the blood immediately after injection | **Poiseuille’s Equation (assumes laminar flow)**  **R**=Resistance  **L**=Length of tube  **η=viscosity of blood**. Constant unless pathological (Severe anemia ↓, polycythemia ↑)  r=Radius of tube  Conditions w/ Large CO and unchanged SA (↑ velocity)   * AV fistulas * Pregnancy * Aortic Regurgitation   Conditions w/ abnormally low viscosity (↑ velocity)   * Severe anemia | **Turbulent Flow (Reynolds #)**  **ρ**=density  **D**=diameter of vessel  **v**=velocity of blood  **η**=blood viscosity  \*all we need to know is ↑ the velocity 🡪 the ↑ the Reynolds number 🡪 ↑ the Pressure needs to be  Occurs when Reynolds Number >3000  Severe anemia: viscosity ↓  Also occurs with changes in vessel wall (atherosclerosis= ↓ SA of BV 🡪 ↑ velocity and the blood becomes more turbulent)  Conditions w/ Turbulent flow   * Aortic Stenosis   + LV🡪aorta   + Narrow orifice 🡪 ↑ velocity * Coarctation of aorta   + Aortic arch🡪Desc. Aorta   + Aorta is constricted * PDA, VSD   + LV🡪R heart * Aortic Regurgitation   + Aorta🡪 LV |
| To Measure Coronary BF   * Thallium scanning * Thallium is a K+ analog * Measure uptake of thallium * --stressed myocardium will show dark spots of reduced blood flow on the scan |
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